(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 921 155 A1

(12) EUROPEAN PATENT APPLICATION

published in accordance with Art. 158(3) EPC

(43) Date of publication:
09.06.1999 Bulletin 1999/23

(21) Application number: **97935804.1**

(22) Date of filing: **19.08.1997**

(51) Int. Cl.[6]: **C08L 27/12**, C08K 5/13, C08K 5/17, C09D 127/12

(86) International application number:
PCT/JP97/02853

(87) International publication number:
WO 98/07784 (26.02.1998 Gazette 1998/08)

(84) Designated Contracting States:
DE FR GB IT

(30) Priority: **23.08.1996 JP 22218396**

(71) Applicant:
DAIKIN INDUSTRIES, LIMITED
Osaka-shi Osaka 530 (JP)

(72) Inventors:
- **TOMIHASHI, Nobuyuki,**
  Yodogawa Works
  Settsu-shi, Osaka 566 (JP)
- **TERASAKA, Kiyotaro,**
  Yodogawa Works of
  Settsu-shi, Osaka 566 (JP)
- **KINOSHITA, Toshiyuki,**
  Yodogawa Works of
  Settsu-shi, Osaka 566 (JP)

(74) Representative: **HOFFMANN - EITLE**
Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München (DE)

(54) FLUORORUBBER COATING COMPOSITION

(57) A coating composition of a fluororubber containing a fluorine-containing elastomeric copolymer which has repeating units of the formula: $-CH_2-$ in the backbone, a polyol curing agent, and a salt or a complex compound of a basic compound having a pKa of at least 8 and an organic acid as a curing accelerator. This composition is a one-pack type composition having a long pot life, and can provide a cured coating in a short time at a relatively low temperature. Furthermore, this composition can be applied by dispenser type coating or screen printing, even when the concentration of the fluorine-containing copolymer is high.

EP 0 921 155 A1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a coating composition of a fluororubber. In particular, the present invention relates to a curable composition of a fluororubber suitable for coating, which comprises a fluorine-containing copolymer, a polyol curing agent, and a specific curing accelerator.

PRIOR ART

[0002] When fluororubbers are cured with polyols, curing accelerators (basic compounds) are added to curable compositions. However, when curing accelerators are added to the curable compositions of fluororubbers, for example coating compositions, the pot life of the compositions is shortened, since the compositions are gelled. Thus, two or more pack type compositions are prepared and practically used, but practically usable one-pack type compositions are not known.

[0003] It may be contemplated to use a curing accelerator having a low reactivity to formulate a polyl-curable fluororubber coating composition in the form of a one-pack composition. However, such a composition requires a long time and heating at high temperatures to obtain a coated film by drying and calcining the coating compositions.

SUMMARY OF THE INVENTION

[0004] One object of the present invention is to formulate a polyol-curable fluororubber composition in the form of a one-pack type composition having a long pot life, and to provide a curable composition of a fluororubber which can provide a cured coating film having a high strength in a short time at a relatively low temperature.

[0005] Another object of the present invention is to provide a one-pack type curable composition of a fluorine-containing copolymer, which can be applied by dispenser type coating or screen printing, even when the concentration of the fluorine-containing copolymer is high.

[0006] To achieve these objects, the present invention provides a coating composition of a fluororubber comprising a fluorine-containing elastomeric copolymer which comprises repeating units of the formula: $-CH_2-$ in the backbone, a polyol curing agent, and a salt or a complex compound of a basic compound having a pKa of at least 8 and an organic acid as a curing accelerator.

DETAILED DESCRIPTION OF THE INVENTION

[0007] Now, each component contained in the composition of the present invention will be explained.

[0008] (A) A fluorine-containing elastomeric copolymer contained in the composition of the present invention is a fluorine-containing copolymer comprising repeating units of the formula: $-CH_2-$ in the backbone. Typical examples of such a copolymer include fluorine-containing copolymers comprising vinylidene fluoride. Specific examples of such copolymers are those copolymers comprising repeating units having the following structures:

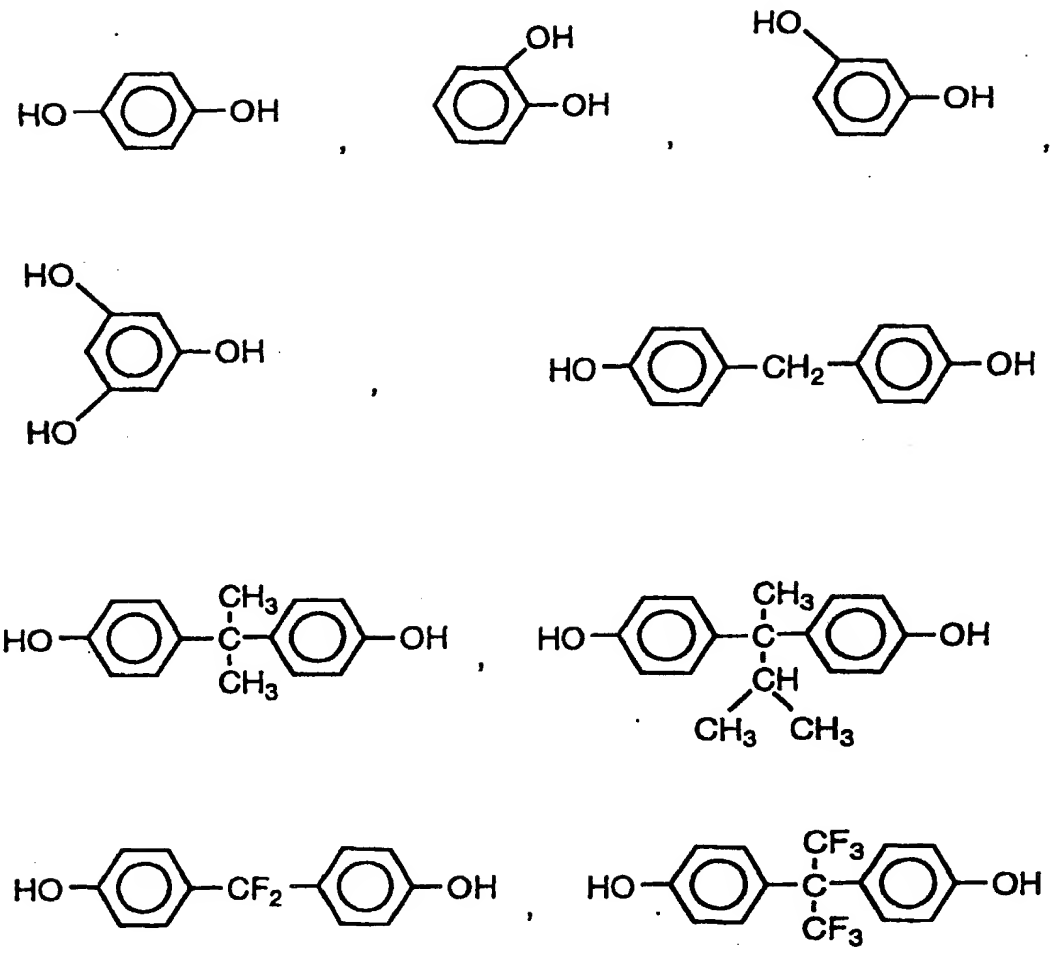
at least one repeating unit selected from the group consisting of $-CF_2-CH_2-$, $-CH_2-CH_2-$ and $-CH_2-CH(CH_3)-$, and at least one repeating unit selected from the group consisting of $-CF_2-CF(CF_3)-$, $-CF_2-CH_2-$ and $-CF_2-(ORf)CF-$ in which Rf is a fluoroalkyl group having 1 to 6 carbon atoms.

[0009] Specific examples of such copolymers are a copolymer comprising vinylidene difluoride and hexafluoropropylene, a copolymer comprising vinylidene difluoride, tetrafluoroethylene and hexafluoropropylene, a copolymer of ethylene and hexafluoropropylene, a copolymer of tetrafluoroethylene and propylene, and the like.

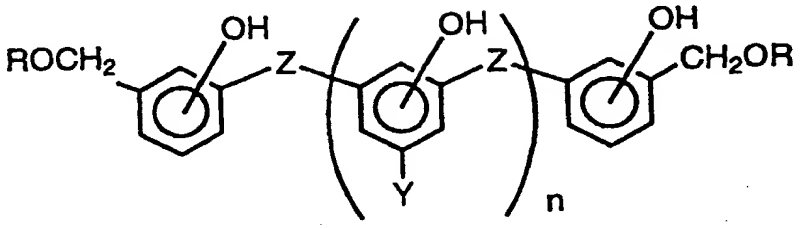
[0010] Such fluorine-containing elastomeric copolymers are commercially distributed under the trade name of "DAIEL" (trademark) (available from Daikin Industries, Ltd.), "VITONE FLOME" (available from E. I. duPont), "AFLAS" (available from ASAHI GLASS Co., Ltd.), etc.

(B) Polyol curing agents

[0011] Polyol curing agents used in the present invention are compounds or polymers having at least two hydroxyl groups, in particular, phenolic hydroxyl groups in a molecule, and having a curing capability. Specific examples of polyol curing agents are phenol compounds such as



and phenolic resins represented by the formula:



wherein Z is $-CH_2-$ or $-CH_2OCH_2-$, Y is a hydrogen atom, a halogen atom, -R, $-CH_2OR$ or -OR in which R is an alkyl group having 1 to 4 carbon atoms, and n is an integer of 0 to 100.

[0012] Among them, hydroquinone, bisphenol A, bisphenol AF, and resorcinol phenolic resins are preferable.

(C) Curing accelerators

[0013] Examples of basic compounds which constitute curing accelerators which are used in the present invention include the following compounds:

Quaternary ammonium salts

[0014] A quaternary ammonium salt of the formula:

$$NR_4X \text{ or } R_3N\text{-}R'\text{-}NR_3 \cdot 2X$$

wherein X is an acid radical or a hydroxyl group; R groups are the same or different and represent an alkyl group having 1 to 20 carbon atoms, a halogenated alkyl group having 1 to 20 carbon atoms or an aryl group having 7 to 20 carbon atoms, provided that two or more R groups may together form a carbocyclic group or a heterocyclic group; R' is an alkylene group having 2 to 21 carbon atom or a phenylenedialkylene group having 8 to 12 carbon atoms.

[0015] Examples of acid radicals include halides, sulfate, sulfite, bisulfite, thiosulfate, sulfide, polysulfide, hydrogen sulfide, thiocyanate, carbonate, bicarbonate, nitrate, carboxylate, borate, phosphate, biphosphate, phosphite, perchlorate, bifluoride, arsenate, ferricyanide, ferrocyanide, molybdate, selenate, selenite, uranate, tungstate, etc.

[0016] Specific examples of quaternary ammonium salts include alkyl and aralkyl quaternary ammonium salts (e.g. trimethylbenzylammonium chloride, triethylbenzylammonium chloride, dimethyldecylbenzylammonium chloride, triethylbenzylammonium chloride, myristylbenzyldimethylammonium chloride, dodecyltrimethylammonium chloride, dimethyltetradecylbenzylammonium chloride, trimethyltetradecylammonium chloride, coconuttrimethylammonium chloride, stearyltrimethylammonium chloride, distearyldimethylammonium chloride, tetrabutylammonium hydroxide, 1,4-phenylenedimethylene-bistrimethylammonium dichloride, ethylenebistriethylammonium dibromide, etc.), and quaternary 1,8-diaza-bicyclo[5.4.0]-7-undecenium salts (e.g. 8-methyl-1,8-diaza-bicylo[5.4.0]-7-undecenium chloride, 8-methyl-1,8-diaza-bicylo[5.4.0]-7-undecenium iodide, 8-methyl-1,8-diaza-bicylo[5.4.0]-7-undecenium hydroxide, 8-methyl-1,8-diaza-bicylo[5.4.0]-7-undecenium methylsulfate, 8-methyl-1,8-diaza-bicylo[5.4.0]-7-undecenium bromide, 8-propyl-1,8-diaza-bicylo[5.4.0]-7-undecenium bromide, 8-dodecyl-1,8-diaza-bicylo[5.4.0]-7-undecenium chloride, 8-dodecyl-1,8-diaza-bicylo[5.4.0]-7-undecenium hydroxide, 8-eicosyl-1,8-diaza-bicylo[5.4.0]-7-undecenium chloride, 8-tetracosyl-1,8-diaza-bicylo[5.4.0]-7-undecenium chloride, 8-benzyl-1,8-diaza-bicylo[5.4.0]-7-undecenium chloride, 8-benzyl-1,8-diaza-bicylo[5.4.0]-7-undecenium hydroxide, 8-phenethyl-1,8-diaza-bicylo[5.4.0]-7-undecenium chloride, 8-(3-phenylpropyl)-1,8-diaza-bicylo[5.4.0]-7-undecenium chloride, etc.).

Tertiary amines

[0017] In general, a tertiary amine is represented by the formula:

$$NR_3 \text{ or } R_2N\text{-}R'\text{-}NR_2$$

wherein R groups are the same or different and represent an alkyl group having 1 to 20 carbon atoms, an alkenyl group having 1 to 20 carbon atoms or an aryl group having 7 to 20 carbon atoms, provided that two or more R groups may together form a carbocyclid group or a heterocyclic group; R' is an alkylene group having 2 to 21 carbon atom or a phenylenedialkylene group having 8 to 12 carbon atoms.

[0018] Specific examples of tertiary amines include trimethylamine, triethylamine, tri-n-propylamine, tri-n-butylamine, triisobutylamine, methyldiethylamine, dimethylethylamine, dimetyl-n-propylamine, dimethyl-n-butylamine, dimethylisobutylamine, dimethylisopropylamine, dimethyl-sec.-butylamine, dimethyl-tert.-butylamine, triallylamine, diallylmethylamine, allyldimethylamine, benzyldimethylamine, benzyldiethylamine, N-allylpiperidine, N-ethylpiperidine, N-butylpiperidine, N-methylpyrrolidine, N-cyclohexylpyrrolidine, N-n-butylpyrrolidine, N-methylpyrrolidine, N-benzylpyrrolidine, 2,4,6-trimethylpyridine, etc.

[0019] Primary and secondary amines are less preferable, since they induce reactions other than the polyol curing. In addition, amines having pKa of less than 8 are less preferable, since they have a low curing rate, and provide films having low strength.

[0020] Organic acids having 1 to 9 carbon atoms, preferably 1 to 4 carbon atoms are used as organic acids constituting the curing accelerators of the present invention.

[0021] Organic acids having 10 or more carbon atoms are less preferable, since they remain in coated films.

[0022] Preferable examples of organic acids are monocarboxylic acids such as fumaric acid, acetic acid, propionic acid, etc.; and dicarboxylic acids such as oxalic acid, malonic acid, succinic acid, etc.

[0023] Organic acids are used to suppress the polyol curing of fluorine-containing copolymers in the compositions. The curing of fluorine-containing copolymers is suppressed by organic acids in the compositions, but the organic acids evaporate or decompose when the compositions are applied onto a substrate, dried and calcined. Thus, the above basic compounds accelerate the curing reaction.

[0024] The composition of the present invention comprises 0.1 to 10 wt. parts, preferably 1 to 5 wt. parts of a polyol curing agent, and 0.01 to 10 wt. parts, preferably 0.05 to 5 wt. parts of a curing accelerator, per 100 wt. parts of a fluo-

rine-containing copolymer.

[0025] When the amount of a curing accelerator is less than the above lower limit, the curing of the copolymer hardly proceeds. When the amount of a curing accelerator exceeds the above upper limit, it may be difficult to control a curing reaction.

[0026] The composition of the present invention may contain various additives which are added to conventional fluororubber compositions, for example, fillers, colorants, acid-scavengers, and the like, in addition to the above polyol curing agents and curing accelerators.

[0027] Examples of fillers are carbon black, white carbon, calcium carbonate, barium sulfate, etc., and examples of colorants are inorganic pigments, compound oxide pigments, etc.

[0028] Examples of acid-scavengers are magnesium oxide, lead oxide, zinc oxide, lead carbonate, zinc carbonate, double salts such as hydrotalcite, etc. Compounds having a high activity (reactivity) such as calcium hydroxide are less preferred, since they tend to cause gelatinization.

[0029] Preferably, acid-scavengers have a smaller pKa than that of the above basic compounds. When the pKa of acid-scavengers is high, the compositions of the present invention tend to be gelled.

[0030] In general, an acid-scavenger is compounded in an amount of from 1 to 40 wt. parts per 100 wt. parts of a fluorine-containing copolymer, depending on its activity.

[0031] Furthermore, non-tackiness can be imparted to the compositions of the present invention by the compounding of fluororesins (e.g. polyvinylidene fluoride (PVdF), ethylene-tetrafluoroethylene copolymers (ETFE), polychlorotrifluoroethylene (CTFE), ethylene-perfluoroalkyl vinyl ether copolymers (EPA), tetrafluoroethylene-hexafluoropropylene copolymers (FEP), perfluoroalkyl vinyl ether polymers (PFA), polytetrafluoroethylene (PTFE), etc.).

[0032] The compositions of fluorine-containing elastomeric copolymers according to the present invention can be used as surface-modifiers of metals or rubbers; metal gaskets and other sealing or coating materials which are required to have heat resistance, solvent resistance, chemical resistance, and non-tackiness; and coating materials to coat rolls and belts for office automation equipment; and the like. Fabrics, which are impregnated with the compositions of the present invention and baked, can be used as the materials of sheets and belts.

[0033] The compositions of the present invention may be applied as sealants of sealing members which have been difficult to shape, precoated metals formed by treating metal plates with primers, packing rubbers, O-rings, diaphragms, chemical-resistant tubes, caps of vials, fuel hoses, and the like.

[0034] The compositions of the present invention may be prepared by the same methods as those used to prepare conventional curable compositions of fluorine-containing copolymers.

[0035] A basic compound and an organic acid, which constitute curing accelerators, are preferably dissolved in alchol together with a polyol curing agent.

[0036] A fluororubber is kneaded with optional fillers, colorants and acid-scavengers, and optionally with a polyol curing agent, and then dissolved in a solvent such as ketones, esters or ethers.

[0037] If necessary, a small amount of coating additives such as silicone oils, or a small amount of poor solvents such as toluene, xylene, etc. is added to the compositions of the present invention.

[0038] Then, the alcoholic solution containing a basic compound, an organic acid and optionally a polyol curing agent is mixed in the above solution of a fluororubber to obtain a coating composition.

[0039] In this case, the concentration of a fluororubber is preferably from 10 to 60 wt. % of the whole composition.

[0040] The compositions of the present invention can be applied to substrates and cured by the same methods as those used to apply and cure conventional curable compositions of fluorine-containing copolymers.

[0041] For example, the compositions are applied to substrates to be coated by brush coating, spray coating, dip coating, flow coating, dispenser coating, screen coating, etc. according to the properties of the compositions, and solvents are evaporated off. Then, the coated compositions are baked at a temperature of from 150 to 250°C for 20 to 90 minutes.

[0042] It is preferable to form a primer layer on the surface of a substrate with silane primers, silicone primers, etc. to increase the adhesion between the substrate and the composition.

[0043] The curable compositions of fluorine-containing elastomeric copolymers according to the present invention have good storage stability and can contain the fluorine-containing copolymers at a high concentration, although they are in the form of a one-pack type composition.

EXAMPLES

[0044] The present invention will be illustrated by the following examples.

Examples 1-5 and Comparative Examples 1 and 2

Example 1

Preparation of a coating composition:

[0045] A fluororubber (DAIEL G-801 available from Daikin Industries, Ltd.) (100 wt. parts) was kneaded with open rolls together with MT carbon black (20 wt. parts) and an acid-scavenger (HYDROTALCITE DHT-4A available from Kyowa Chemical Industries, Ltd.; pH = 9) (5 wt. parts) to obtain a compound. The compound was dissolved in a mixed solvent of butyl acetate (400 wt. parts) and methyl isobutyl ketone (400 parts).

[0046] Separately, bisphenol AF (2 wt. parts) as a polyol curing agent and DBU-b (8-benzyl-1,8-diaza-bicyclo[5.4.0]-7-undecenium chloride having pKa of 11.5) (0.5 wt. parts) as a basic compound were dissolved in ethanol (17.5 wt. parts). Then, acetic acid (2 wt. parts) and xylene (4 wt. parts) were added to the solution. The obtained solution was mixed with the above solution of the compound with a disper to obtain a coating composition.

Stability test:

[0047] A quantity of the coating composition was charged in a polyethylene bottle and kept standing at 25°C. After 2 days, 7 days, 2 weeks, one month and three months, the properties of the composition were observed.

Properties of a coating film

[0048] The coating composition was poured in a metal vat and dried at room temperature for 5 days, and then at a temperature of 80 to 100°C for 2 days, followed by baking at 200°C for 30 minutes. The obtained film was peeled off from the vat, and stamped in the form of a JIS No. 4 dumbbell. This sample was subjected to a tensile test at a pulling rate of 500 mm/min.

Comparative Example 1

[0049] The same procedures as those of Example 1 were repeated, except that no acetic acid was used in the preparation step of the coating composition.

Example 2

[0050] The same procedures as those of Example 1 were repeated, except that MgO (MA-150 available from Kyowa Chemical Industries, Ltd.) (3 wt. parts) was used in place of DHT-4A (5 wt. parts) in the preparation step of the coating composition.

Example 3

[0051] The same procedures as those of Example 1 were repeated, except that HITANOL 4020 (available from Hitachi Chemical Co., Ltd.; a main component: resol phenolic resin; solid content: 50%) (10 wt. parts) was used in place of bisphenol AF in the preparation step of the coating composition.

Example 4

[0052] The same procedures as those of Example 1 were repeated, except that DAIEL G-501 NK (available from Daikin Industries, Ltd.) was used in place of DAIEL G-801 in the preparation step of the coating composition.

Comparative Example 2

[0053] The same procedures as those of Example 1 were repeated, except that MgO having a pKa of 11 (MA-150) (3 wt. parts) and $Ca(OH)_2$ having a pKa of 13 (6 wt. parts) were used in place of DHT-4A (5 wt. parts) in the preparation step of the coating composition.

Comparative Example 3

[0054] The same procedures as those of Example 1 were repeated, except that pyridine having pKa of 5.3 was used

in place of DBU-b in the preparation step of the coating composition.

[0055] The stability of the coating compositions and the strength of the films are summarized in Table 1.

Table 1

Component (wt. %)	Ex. 1	Comp. Ex. 1	Ex. 2	Ex. 3	Ex. 4	Comp. Ex. 2	Comp. Ex. 3
Fluororubber -DAIEL G-801 -DAIEL G-501NK	100	100	100	100	100	100	100
MT carbon black	20	20	20	20	20	20	20
Acid-scavenger -Hydrotalcite DHT-4A -MgO MA-150 -$Ca(OH)_2$	5	5	3	5	5	3 6	5
Polyol curing agent -Bisphenol AF -HITANOL	2	2	2	10	2	2	2
Basic compound -DBU-b -Pyridine	0.5	0.5	0.5	0.5	0.5	0.5	2
Acetic acid	2	0	2	2	2	2	2
Ethanol	17.5	17.5	17.5	4.5	17.5	17.5	17.5
n-Butyl acetate Methyl isobutyl ketone Xylene	400 400 4	400 400 4	400 400 4	400 400 4	400 400 4	400 400 4	400 400 4
Stability of coating composition	No change after 6 months	Gelled in 2 days	Gelled after 3 months	No change after 6 months	No change after 6 months	Gelled after 8 hours	No change after 6 months
Strength of film (Kgf/cm^2) [JIS K 6301 No. 4 dumbbell]	96	104	100	84	90	110	40
Elongation of film (pulling rate: 500 mm/min.)	290 %	280 %	280 %	320 %	330 %	250 %	650 %

Claims

1. A coating composition of a fluororubber comprising a fluorine-containing elastomeric copolymer which comprises repeating units of the formula: $-CH_2-$ in the backbone, a polyol curing agent, and a salt or a complex compound of a basic compound having a pKa of at least 8 and an organic acid as a curing accelerator.

2. A coating composition according to claim 1, wherein said curing accelerator is a salt or a complex of a tertiary basic compound having a pKa of at least 8, and an organic acid.

3. A coating composition according to claim 1, wherein said curing accelerator is a salt or a complex of a basic compound having a pKa of at least 8, and an organic acid having 1 to 9 carbon atoms.

4. A coating composition according to claim 1, wherein said curing accelerator is a salt or a complex of a tertiary basic compound having a pKa of at least 8, and an organic acid having 1 to 9 carbon atoms.

5. A coating composition according to claim 1, wherein said curing accelerator is a salt or a complex of a tertiary amine having a pKa of at least 8, and an organic acid having 1 to 9 carbon atoms.

6. A coating composition according to any one of claims 1 to 5, which further comprises an acid-scavenger having a pKa smaller than that of said basic compound.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP97/02853

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl^6 C08L27/12, C08K5/13, 5/17, C09D127/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int. Cl^6 C08L1/00-101/14, C08K3/00-13/08, C09D1/00-201/10

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	JP, 9-188793, A (Daikin Industries, Ltd.), July 22, 1997 (22. 07. 97), Claim; Par. Nos. (0010) to (0024) (Family: none)	1 - 6
X Y	JP, 6-306241, A (Asahi Glass Co., Ltd.), November 1, 1994 (01. 11. 94), Claim; Par. Nos. (0008), (0009) (Family: none)	1, 3, 6 2, 4, 5
X	JP, 6-207068, A (Minnesota Mining & Mfg. Co.), July 26, 1994 (26. 07. 94), Par. Nos. (0027) to (0030) & EP, 670868, A1	1 - 6
X Y	JP, 3-234752, A (Asahi Glass Co., Ltd.), October 18, 1991 (18. 10. 91), Claim; page 3, upper left column, 8th line from the bottom to last line (Family: none)	1, 3, 6 2, 4, 5
X Y	JP, 3-174461, A (E.I. Du Pont de Nemours & Co.), July 29, 1991 (29. 07. 91), Claim & EP, 420662, A2	1, 3, 6 2, 4, 5

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
October 9, 1997 (09. 10. 97)	October 21, 1997 (21. 10. 97)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP97/02853

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP, 2-209942, A (Asahi Glass Co., Ltd.), August 21, 1990 (21. 08. 90), Claim; page 3 (Family: none)	1, 3, 6 2, 4, 5
X Y	JP, 57-164143, A (Nippon Mektron, Ltd.), October 8, 1982 (08. 10. 82), Claim (Family: none)	1, 3, 6 2, 4, 5

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

EPA/EPO/OEB
D-80298 München
+49 89 2399-0
TX 523 656 epmu d
FAX +49 89 2399-4465

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Generaldirektion 2 | Directorate General 2 | Direction Générale 2

Telephone Numbers:
Primary Examiner (substantive examination) +49 89 2399-8313
Formalities Officer / Assistant (Formalities and other matters) +49 89 2399-8021

HOFFMANN - EITLE
Patent- und Rechtsanwälte
Arabellastrasse 4
81925 München
ALLEMAGNE

EINGEGANGEN
- 2. April 2003
HOFFMANN • EITLE, MÜNCHEN
PATENTANWÄLTE RECHTSANWÄLTE

Application No.	Ref.	Date
99 906 457.9-2102	84 216 a/scho	01.04.2003

Applicant
Daikin Industries, Ltd.

RECEIVED
APR 16 2003
TC 1700

Communication pursuant to Article 96(2) EPC

The examination of the above-identified application has revealed that it does not meet the requirements of the European Patent Convention for the reasons enclosed herewith. If the deficiencies indicated are not rectified the application may be refused pursuant to Article 97(1) EPC.

You are invited to file your observations and insofar as the deficiencies are such as to be rectifiable, to correct the indicated deficiencies within a period

of 2 months

from the notification of this communication, this period being computed in accordance with Rules 78(2) and 83(2) and (4) EPC.

One set of amendments to the description, claims and drawings is to be filed within the said period on separate sheets (Rule 36(1) EPC).

Failure to comply with this invitation in due time will result in the application being deemed to be withdrawn (Article 96(3) EPC).

EUROPÄISCHES PATENTAMT - EUROPEAN PATENT OFFICE - OFFICE EUROPÉEN DES BREVETS

DURY O C P
Primary Examiner
for the Examining Division

Enclosure(s): 2 page/s reasons (Form 2906)

Registered Letter

The examination is being carried out on the **following application documents:**

Text for the Contracting States:
DE FR IT GB

Description, pages:

3-6,8-22	as received on	26.09.2000	with letter of	26.09.2000
1,2,7	as received on	21.02.2003	with letter of	21.02.2003

Claims, No.:

1-12	as received on	21.02.2003	with letter of	21.02.2003

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1. **Art. 123(2) EPC**

The amendments filed appear to fulfill the requirements of Art. 123(2) EPC.

2. **Inventive step: Art. 56 EPC**

None of the examples on file has been performed using a curing accelerator according to amended claim 1 (U CAT SA102 appears to be a quaternary ammonium salt which does not fit with the formulae on file) and may be used to support an inventive merit. Besides, the argumentation of the Applicant, that the claimed accelerators leads to a shorter pot life than the quaternary ammonium salt according to the prior art (improved technical effect which would support the inventive step) is not supported by the evidence and can, thus, not be taken into account for the assessment of the inventive. This result is indeed surprising since, according to the original application, the tertiary amines now claimed and quaternary ammonium salts as used in the prior art were disclosed as equivalent alternatives (see pages 5-7 of the application). This argument should, therefore, be supported by the facts.

Hence, the objective problem of the application has to be seen as the provision of **further, alternative** aqueous fluoroelastomer curable coating compositions.
Starting from any of D1-D2 as closest prior art it is obvious to solve this problem by using any known curing accelerators, included those according to amended claim 1 which are known in the art e.g. from EP-A 0 921 155 (family document of the PCT application cited on page 1, last line of the original application).

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3. **Clarity: Art. 84 EPC**

The description (see e.g. pages 5-7) should be adapted to the valid set of claims. In particular the comparative examples should be clearly distinguished from the examples illustrative of the invention.

4. Should the above objections not be removed oral proceedings will be organised.

5. Providing an amended set of claims, the applicant is requested to clearly point out where **in the application as filed** the basis for the amendment(s) can be found in order to verify that the requirements of Article 123(2) EPC have been fulfilled.

O. Dury